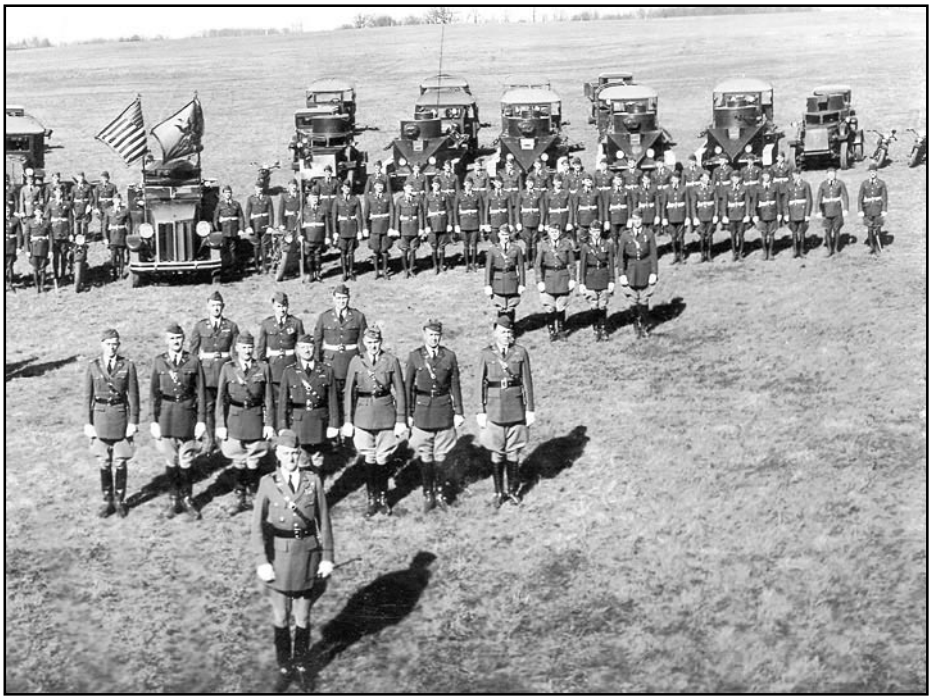
The American Roots of Blitzkrieg

What the Germans Learned in Visits to Fort Knox Before World War II Broke Out in Europe

by Dr. George F. Hofmann



Colonel Van Voorhis, foreground, stands in formation with his troops at Fort Knox in the 1930s. Note the wide range of equipment, including tanks and armored cars, as America attempted to forge its first mechanized force.

During the early 1930s, long before Germany's panzer divisions rolled into Poland and introduced the world to *blitzkrieg*, or lightning war, the German Army had been studying how other nations were approaching mechanization, the employment of tanks, and the theoretical promise of maneuver warfare.

In developing their doctrine, Reichswehr and Wehrmacht staff officers visited other nations that were wrestling with these same problems, including England, France, the Soviet Union, and the United States. These intelligence-gathering missions brought them to Fort Knox, Fort Benning, Fort Eustis, and Fort Meade where they observed how the American Army was applying the potential of the internal combustion engine to future warfare.

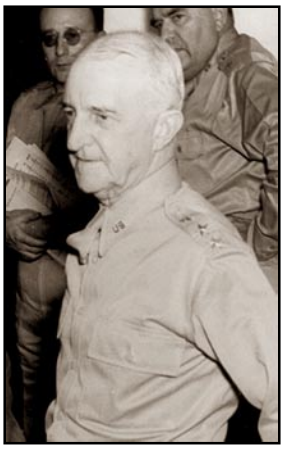
In the fall of 1930, as Major Heinz Guderian was working on the problem of troop motorization at the German Defense Ministry, one of his colleagues, Captain Adolf von Schell, was attending the Infantry School's advanced course at Fort Benning. As a student, von Schell materially contributed to the school by sharing his experiences in World War I.[1] In addition, he was very adept at discussing modern concepts of mobile warfare, then a major area of investigation for the German Army. Exploring these interests, von Schell requested a two-week attachment to the U.S. Tank School, then at Fort Meade, where he wanted to observe the 34th Infantry (Motorized). This unit had detached a machine gun company to Fort Eustis, Virginia, to join the Mechanized Force, an experiment that lasted only about a year. Although von Schell's visit was approved, it was later cancelled because the 34th Infantry was in the process of changing station.

The Mechanized Force was experimental in the sense that it was composed of combined arms capable of independent operations as a mobile force that went far beyond traditional infantry and cavalry formations. This futuristic vision, similar to a British experiment in the late 1920s, was short-lived. The experiment ended in the fall of 1931, partly a casualty of inter-branch rivalry, partly a casualty of the Depression that had gripped the nation. The vision was deferred until July 1940, when the combined arms Armored Force was created over the objections of the chiefs of the Infantry and Cavalry branches. In the meantime, each branch was directed to pursue mechanization on its own.

Following this guidance later in the 1930s, the Cavalry branch created a mechanized force at Fort Knox, which also drew German interest and led to additional staff visits. Colonel Daniel Van Voorhis, the commander of the 1st Cavalry (Mechanized) and his S3, Major Robert W. Grow, recalled German visits to Fort Knox in 1933, including one by a Major Phillips, a German general staff officer. Phillips, an ordnance tank expert, expressed ideas on mechanization that agreed with the developments at Fort Knox, where Colonel Van Voorhis was developing a self-

Captain Adolf von Schell, far left, visited Fort Knox to observe the U.S. approach to mechanization as his superior, General Heinz Guderian, at left, planned Germany's mechanized force.

Leading the U.S. effort at the time was Colonel Daniel Van Voorhis, at right, who was testing new weapons and new theories of mobile warfare at the Kentucky post.



contained mobile force capable of deep operations and fighting mounted. A few months later, Major Phillips was back at Knox, this time with Major Hans von Greiffenberg, another general staff officer. The visitors took rides in the 1st Cavalry's armored cars, observed demonstrations of new radio equipment, and after hours, retired to the Doe Run Inn for dinner and discussions with their hosts.

Colonel Van Voorhis recalled that the Germans were not particularly interested in the Americans' equipment, but on their views about the proper tactical and strategic employment of mechanized forces. Major Grow, who accompanied Van Voorhis, agreed, and added that the thinking at Fort Knox regarding the employment of self-contained units was ahead of the Germans. It was Grow's opinion, however, that the German Army was more advanced in the development of vehicular equipment. In addition, Grow wrote in his diary that the German military was "going all out in anticipation of a European war."[2]

At the time of the Germans' visit, the 1st Cavalry (Mechanized) included the Armored Car Troop for long distance reconnaissance; the Scout Troop for close-in reconnaissance and security; the assaulting or striking squadron of combat cars; and their holding unit, the Machine Gun Troop. Communications were carried out largely by a simple code system over voice radio supplemented by motorcycles, automobiles, and hand signals.[3]

The following year, at the beginning of the important Fort Riley maneuvers in spring 1934, the 1st Cavalry (Mechanized) commanded by Colonel Adna R. Chaffee, Jr., demonstrated its operational mobility by traveling overland from Fort Knox. The maneuvers were designed to determine how far the cavalry had progressed with mechanization, motorization, and new weapons development for deep operations with a self-contained force.

Before the maneuvers, Army Ordnance developed a new combat car for the mechanized Cavalry, the 9.5-ton convertible Combat Car T4. The design was based on the Christie Combat Car T1. By mid 1932, four CCT1s had arrived at Fort Knox and became the nucleus for the striking squadron. Like the CCT1, the CCT4 employed the convertible wheel-and-track and helical spring suspension system, and was briefly tested at Fort Knox before the Fort Riley maneuvers. The test committee recommended the vehicle, with modifications, be declared standard. It was a decision Chaffee strongly supported based on his earlier experience observing the Christie tank acceptance tests and comparing those with the CCT4's operational mobility and speed.

During service tests following the maneuvers, the CCT4 outperformed the Ordnance-designed 7-ton CCT5, which displayed a double "Mae West" turret and a new rigid suspension system. The CCT5 was a radical departure from the Christie design. The vehicle was full tracked and non-convertible, employing a volute spring or bogey suspension system with a divided power train. During the tests, the Christie type suspension system provided a more stable gun platform with better ditch-crossing capabilities, while the Ordnance-designed vehicle was more maneuverable but so choppy in cross-country performance that accurate marching fire was impossible.[4] Understandably, observers at Fort Riley did not favorably view the "Mae West" profile.[5]

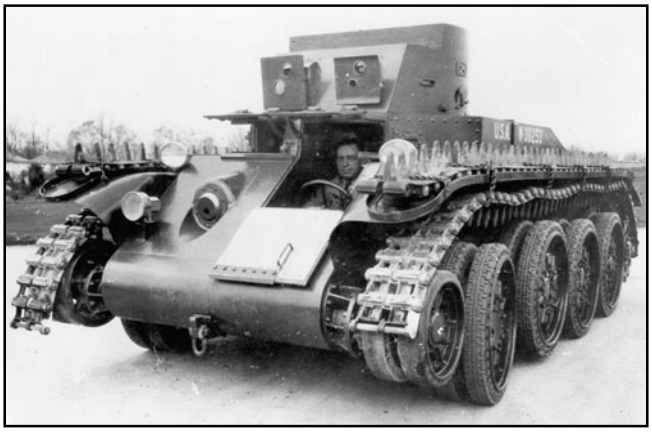
At year's end, Chaffee was overruled. The decision was made to acquire a modified CCT5 (minus the "Mae West") for the cavalry. Generally, combat car proponents at user level favored the CCT4. At the staff level, however, the War Department favored the 7-ton weight and lower cost of the CCT5, thus taking advantage of the opportunity to produce a less expensive vehicle manufactured at Rock Island Arsenal. In addition, the CCT5 avoided the engineering dilemma imposed by the wheel-track convertible design. Captain H.H.D. Heiberg, who served with the mechanized cavalry since 1932, recalled that the decision to adopt the CCT5 was made in the War Department "by officers [who had] probably never ridden in a tank, much less fired from one."[6] More so, the decision was driven by a War Department directive to impose a weight limit of seven tons. The CCT5 was standardized for production as the Combat Car M1. The vehicle reflected certain features, such as the Ordnance-designed volute suspension system, which remained characteristic of all U.S. tanks until late in World War II.[7]

In November 1936, a reported German tank expert wrote in the military weekly, *Militar Wochenblatt*, that in spite of its high speed, the CCT5 was a "perfect example of bad construction." The Americans had repeated all the mistakes European tank and armored car builders had made, he noted. Furthermore, American tank armor was too light to resist modern weapons.[8] Heinz Guderian, who was emerging as a key German practitioner of armored warfare, noted that the Christie tank developed by the Red Army since the early 1930s was also too light; however, it was a well-designed and tested machine with great speed.[9]

The War Department, however, defended its mechanized equipment, claiming it compared favorably with that of any nation.[10]

(The German observation soon proved correct. When U.S. Army tanks were first employed in Tunisia in February 1943, they lacked sufficient armor and armaments to engage German tanks. This disparity was never corrected until

THE MACHINES: 1930s State of the Art



Above, the unusual Christie convertible wheel/track suspension is seen in the wheeled configuration with its tracks stowed above and below the fenders on each side. Called "combat cars" (the cavalry was prohibited from owning "tanks"), the T4 was armed with machine guns.

Above, the Ordnance-sponsored T5 Combat Car descends a slope during testing. Its vertical volute spring suspension was later a common feature of U.S. light and medium tanks, but the idea of twin turrets was abandoned for tactical reasons.

The first German efforts, like this Pzkpw I destroyed by a field gun in Poland, at right, also proved to be too light for combat and were soon relegated to scouting and command missions. The Pzkpw I was also limited to machine gun armament.

after the Battle of the Bulge, according to General Omar N. Bradley, the commander of the Twelfth Army Group during its assault on Fortress Europe.)[11]

Meanwhile, the Wehrmacht's interest in military developments in the U.S. continued. Writing in the *Militar Wissenschaftliche Rundschau* in January 1936, Colonel Guderian — now considered by the U.S. Army attaché in Berlin as one of the foremost experts on motorization and tanks — noted that the United States occupied the first position among all countries in the world regarding the technical production of its automobiles. Its army, however, has not yet participated in this economic development, he wrote. Guderian criticized the U.S. Army for not giving special attention to Christie tanks, which were given their greatest fulfillment in the Red Army rather than the country of their origin. He was also critical of the autonomy of the U.S. Army branch system that gave control of tanks to the infantry and the cavalry reference of tanks as combat cars. Concluding, he noted that a consolidated authority was lacking.[12]

In November, Guderian published another article in the *Militar Wissenschaftliche Rundschau*, which reflected his strong interest in mechanized warfare as expressed in the United States, England, France, and the Soviet Union. This article represented the official doctrine regarding the employment of tanks in mechanized warfare. He emphasized that the striking power of armored troops must rely on fire, speed, and armor protection. Though the tank was the main maneuver weapon, it must also rely on the cooperation of other combat arms, he argued. Guderian quoted the famous British tank proponent, J.F.C. Fuller, who stated that tanks tied to the infantry decreased the value of that weapon, a problem he found in American and French armies. The mission of the motorized infantry and motorized artillery or the new self-propelled mount was to utilize the effect of a mass tank attack. Regarding air power, Guderian saw the necessity of providing support for the ground attack. Concluding, he stressed opposition to infantry accompanying tanks, the significance of speed, mass, and surprise, and the importance of auxiliary combat arms as organic to tank forces.[13]

Attempts were also made in the U.S. Army to deal with the issue of a mechanized division. Between 1936 and 1937, the Command and General Staff School at Fort Leavenworth published an instructional text describing the organization and tactical employment of a mechanized division. In the text, the mechanized force was described as "all arms," self-contained, and capable of deep independent operations, leading to pursuit and exploitation of success. This doctrine was similar to what the mechanized cavalry was working out for years at Fort Knox. Adding to force mobility, the text saw the use of aviation for command control, reconnaissance, and tactical ground support.[14]

In June 1937, now-Lieutenant Colonel von Schell returned to the United States to visit a number of military bases to again assess the degree of army mechanization. This visit was a result of the courtesies extended by the German government to the U.S. Army Attaché in Berlin to visit their military establishments and inspect mechanized ve-

hicles. The mutual arrangement also provided the atmosphere for selected U.S. Army personnel to attend the *Kriegsakademie*. At the time, von Schell was chief of staff of the Inspector of the Panzer Corps and Army Motorization Bureau. The specific purpose of his visit was to examine the infantry's new light tank and cavalry's combat car, observe their maneuvers, take short rides on roads and cross country, and take external photos. Twelve military bases were on his list to visit.[15] Only three, however, provided very interesting exchanges on mechanization in both countries.

At Fort Meade, the copious note taker von Schell visited with the 66th Infantry (Light Tanks), observed a combat demonstration, rode in a M2 Light Tank, and inspected tank parks and repair shops. Summaries of his impressions were submitted to the War Department and Military Intelligence Division, G-2. Regarding tactical doctrine, he criticized the U.S. Army's attaching tanks to the infantry and suggested they be given an independent mission so a breakthrough could be made broad and deep enough for a successful exploitation. He added that tanks must be supported by self-propelled artillery with 75mm guns or the equivalent. Though he commented little on technical details, von Schell criticized the light M2's armor and noisy gearshift. Nevertheless, he thought the M2 was a smooth-riding tank and was impressed with its speed and reserve power.[16]

Von Schell's remarks on European tanks and doctrine were very illuminating. The 66th Infantry's commander, Colonel S.S. Buckner, Jr., said that they merited serious consideration in connection with the Army's future tank doctrine. Almost predicting the success of the German invasion of France in May 1940, von Schell commented that French doctrine contemplated scattering tanks over wide fronts. As a result, he predicted, they would lose most of their tanks in the first battle. He gave credit to Soviet tanks used in the Spanish Civil War, but criticized the poor performance of Spanish tankers who did not use their tanks in mass, preferring instead to use a few at a time. Nevertheless, he inferred the Red Army had a sound tank doctrine because they believed in mass tank tactics. He added that their leadership was rather weak, due to Stalin's regime purging their key military leaders.

General Chaffee, commanding the Mechanized Cavalry Brigade, with his orders group during a winter exercise at Fort Knox in the late 1930s. Chaffee is second from left and Major Robert Grow is at far right.

For the Italians, he had very little respect, claiming they were not fighters and knew little about tank deployment. Regarding the British, he claimed they dropped behind in tank development and tactics. Interestingly, von Schell found British leaders inclined to be somewhat visionary rather than being realistic regarding tactical doctrine.[17]

Next on his schedule was the Infantry School at Fort Benning, Georgia, where he had the opportunity again to examine the M2 Light Tank. He respected its speed, but criticized its high silhouette, the "Mae West" turrets as creating too many blind spots, the necessity of the crew to stand erect, and the tank's light armor and armament. These deficiencies made American tanks too vulnerable. Von Schell was puzzled that the Infantry and Cavalry should employ the same vehicle for different tactical uses. Again, he was critical of the U.S. Army for attaching tanks the size of companies, battalions, or regiments to the infantry for accompaniment because it squandered a mobile asset. Regarding German tanks, he contemplated that they would be employed in mass at decisive points, tank divisions or corps preferably. He also commented that periscopes were indispensable and that all tanks be equipped with radios for communication.[18]

The largest tank or combat car formation in the U.S. Army was the 7th Cavalry Brigade (Mechanized) at Fort Knox, which von Schell visited next. He examined the Combat Car M1 and observed a tactical exercise in which the 1st Cavalry, one squadron of the 13th Cavalry, and the 68th Field Artillery (Towed) participated. Afterwards, von Schell made a number of comments to General Van Voorhis. He found impractical the .50 caliber machine gun used on the combat cars as an anti-tank weapon, because in the next conflict the cavalry cannot avoid the heavy tank in an infantry fight. In this combat environment, the .50 calibers would be useless. He disapproved of the U.S. Army's autonomous branch system that was dominated by the infantry. Its warfighting doctrine, maneuver and firepower, were solely based on World War I experience and potential operations in the North American Theater. He considered this impractical because, in the future, the U.S. military might find itself again in a European war, and would need to plan for an organization to meet that combat environment, which may contain a preponderance of tanks.[19]

With reference to German mechanization and motorization, he stated that its development was placed under one head. This, he claimed, eliminated a duplication of effort, equipment, and expense. For example, the Panzer Corps of three armored divisions head-

ed German mechanization. Each division had a mechanized brigade capable of employing hundreds of tanks and a *Schutzen* brigade for holding. All three armored divisions were organized to perform the infantry role as well as the cavalry role.[20] In the U.S. Army, the struggle between the infantry and cavalry over who controls tanks seemed ludicrous to the Germans.

Regarding developments at Fort Knox, von Schell mentioned to Van Voorhis, "You are searching and experimenting along the same lines as my army in your efforts to overcome hostile antitank weapons. It is a combination of speed, armor and all other means we can devise, including smoke and mass attack" to deal with this serious problem. The German officer stated that European tanks in the near future would be heavier and carry more armor plate. Light tanks, in turn, would be relegated to a reconnaissance role. However, he felt that first-class European powers would not be ready for a war for years. The French are too provincial, the Italians are too tempestuous, and the Spanish are too decadent, he noted. He was, however, concerned with England, because of its ability to control key points of Europe, such as Gibraltar and the entrance to the Mediterranean Sea, the Suez Canal, and the outposts of the northeastern Atlantic.[21]

These reports on von Schell's visits were of great interest, especially to the cavalry at Fort Knox. In addition, Grow commented that attaché reports dealing with foreign mechanization were also extensively studied. Based on this information, he believed at the time that the mechanized cavalry was ahead, in some respects, of the Germans and way ahead of the French in the doctrine of employment.[22]

Apparently, the issue of tactical air support for the ground forces was not discussed. However, in August 1936, the U.S. Army attaché reported on the development of the Junkers 87 "Stuka" dive-bomber. In 1937, it entered production. German interest in dive-bombing began as early as 1934, and a few years later, Ernst Udet, the chief of the Luftwaffe development branch, showed a marked interest in the U.S. Navy's augmentation of close-support dive-bombing with the development of the Curtiss Helldiver.[23]

The development of the ground attack mission was also improved by German experience in Spain. These events led to the successful tactic that integrated the Luftwaffe with mobile ground forces, providing close air support.[24] Thus by September 1939, the Germans had successfully demonstrated the importance of combining airpower with the principle of fire and maneuver with the combined arms team for deep operations.

The marriage of tactical aviation with the mechanized force at Fort Knox did not progress as it did in Germany. During the interwar period, ground support attack aviation did not develop as expected late in World War I because of neglect, technical problems, and the controversy over mission and air tactics. The *1923 Field Service Regulations: Operations* directed that one of the missions of aviation units was to attack hostile ground forces and their supporting units, including supply columns. No direction was given regarding a tactical effort against enemy tanks or in support of an infantry assault with breakthrough and accompanying tanks. This was due in part to the influence of the controversial Brigadier General William Mitchell, who had questioned the future application of ground attack aircraft because he believed that air power should focus on deep strategic operations against the enemy's supply concentrations and manufacturing areas. By the mid-1930s, ground attack aviation emphasis gave way to high-speed, long-range heavy bombers.[25]

A U.S. Army officer attending the *Kriegsakademie* during this period of amenable exchanges also related developments in mechanization at an operational level. After returning to America, he reported on Germany's development of panzer forces for deep operations with a combined air-ground mechanized force. However, the Army Chief of Staff, General Malin Craig, greeted him with apathy.[26] When the United States entered the war, the liaison between armored units and aviation essential for the successful execution of a blitzkrieg were missing. Neither the Army Air Corps nor the Armored Force had a clear objective regarding ground combat aviation.

Meanwhile, von Schell, whom Guderian claimed was an energetic and indefatigable man with many stimulating ideas,[27] was appointed by Hitler as czar of the German automotive industry, at the same retaining the position of Inspector of the German Tank Corps and Inspector of Army Motorization. The U.S. Army attaché in Berlin found these appointments of great importance, both from a military and commercial viewpoint. The appointments were indicative of Germany's further endeavors towards industrial and military mobilization.[28]

While the Germans were accelerating industrial and military mobilization and finalizing their concept of a lightning war, a board of officers from the 7th Cavalry Brigade (Mechanized) looked to improving their combat capabilities as a mounted force. The Army's attitude, however, was not in agreement. A student at the Army War College summed up this attitude: "I hold here a pamphlet, '*Tactical Employment of the Mechanized Division*,' used as a text at Leavenworth during the past few years. The April directive consigns the booklet to the school archives. There will be no Panzer Division in our Army."[29] This was in reference to the April 1938 War Department policy governing mechanization and tactical employment of mechanized forces. The policy avowed that recent operations in Spain demonstrated that "combatant arms will fight in their traditional roles." It further emphasized that the mechanized cavalry was to adhere to its traditional mission of exploiting the infantry's success.[30] *Army Ordnance* magazine noted that "independent tank forces are a delusion," suggesting tanks be heavily armored and function as mobile supporting artillery or as accompanying artillery for the attacking infantry.[31]

Meanwhile the Cavalry Board recommended replacing towed artillery with self-propelled guns. The board believed self-propelled artillery was necessary to neutralize antitank weapons, while providing general supporting fire for combat cars. The Chief of Field Artillery, however, disagreed. He supported towed artillery, believing that it could deliver far more supporting fire. He also regarded the mechanized cavalry's appeal for self-propelled artillery as no more than a request for a vehicle with all the essential characteristics and limitations of a tank. The solution, he argued, was a combat car armed with a cannon and sufficiently armored to withstand shelling from anti-mechanized weapons.[32] Nevertheless, with support from the Chief of Ordnance a 75mm pack howitzer was mounted on a CCM1 and classified as T3, 75mm Howitzer Motor Carriage. The field artillery, however, considered the T3 unsuitable because of limited crew space.

As a result, no additional ones were built for the mechanized force.[33] Not until Major General Jacob L. Devers replaced General Chaffee as the chief of the Armored Force in August 1941 was serious consideration given to a field artillery doctrine suitable for a mounted force.

In spite of the problems acquiring self-propelled artillery and tactical air support, Chaffee's 7th Cavalry Brigade (Mechanized) continued to test and expand its operational and tactical mobility. During the Plattsburg, New York maneuvers in August 1939, the brigade, in a wide enveloping movement, completed a successful deep operation, leading to Chaffee's recommendation for an armored division.

This occurred before the Germans had launched their blitzkrieg against Poland. The following May, at the Louisiana maneuvers, the reinforced Mechanized Brigade participated for the first time in large unit operations that included a corps and three divisions. It was evident again to Chaffee and a few others who evaluated the maneuvers that, considering the German blitzkrieg, U.S. armored divisions should be created without delay.[34]

In 1943, Van Voorhis commented that German operations in Poland in September 1939 — called the blitzkrieg — coincided with the employment of U.S. Armored Forces, which inherited its doctrine of warfighting with mobile independent units from the mechanized cavalry at Fort Knox.[35] To some extent, this may have some merit, because the Germans profited by American mechanization.

The Germans, however, were able to perfect the blitzkrieg doctrine, whereas the U.S. Army was reactive and not proactive due to the autonomy of the branch system. It was dominated by an infantry doctrine of fire and maneuver that was defined by the Defense Act of 1920, the *1923 Field Service Regulation,* and the decision in 1931 by the Chief of Staff, General Douglas MacArthur, to decentralize mechanization, allowing each combat arm to develop its own branch doctrine.

These decisions denied the Army the ability to formulate a combined arms doctrine necessary to win the first decisive battle.

Notes

[1]Correspondences dealing with von Schell's visit to the U.S. came from the MID (Military Intelligence Division) Files 2257-B-78, July 1930 to June 1931, War Department General and Special Staff, Record Group (RG) 165, National Archives (NA).

[2]Van Voorhis quoted in "Prelude to Armor," in Armored Force Command and Center, Study No. 27, Historical Section, 1946, Army Ground Forces, RG 407, NA, p. 5, and Grow Diary, April 1933, pp. 55-56. Grow's diaries are now in the possession of his grandson.

[3]Grow, "Ten Lean Years: From the Mechanized Force (1930) to the Armored Force (1940)," *ARMOR* (May-June 1987), p. 22. This is part three of four parts of Grow's manuscript written in 1969 that reflected a participant's role in major doctrinal changes regarding mechanization of the U.S. Cavalry during the 1930s. It is primarily based on his daily diary. Also see Hofmann, "Tactics vs Technology: The U.S. Cavalry Experience," *ARMOR* (September-October 1973), pp. 10-14.

[4]Report of Technical Committee, 24 March, and Proceedings of Board of Officers, 25 March 1934, HQ, 1st Cavalry (Mechanized), OO 451.24/1789, Record Group (RG) 156, NA, pp. 1-5 and 1-4; and The Daily Log of Combat Cars T4 and T5, During Test at Fort Riley, 8-21 May 1934, Grow Files in possession of author. Grow was a member of the technical committee at Fort Knox that recommended the CCT4 be declared standard and procured. Also see H.H.D. Heiberg, "Organize a Mechanized Force," pp. 13-15 and "Mechanization in the Army," Lecture: Society of Mechanical Engineers, Pittsburgh, Pa., 23 April 1940, Heiberg Collection, Patton Museum of Cavalry and Armor, Fort Knox, Ky., pp. 11-13.

[5]The "Mae West" arrangement on the CCT5 was caused by the vehicle's divided power train, with the engine in the rear and the transmission in the front. The long connecting drive shaft tunnel bisected the crew compartment, causing an obstruction. Thus, the two side-by-side mounted turrets. The twin-turreted configuration was named for Mae West, a very busty (and bawdy) entertainer of that era.

[6]Heiberg, "Organize a Mechanize Force," pp. 13-15.

[7]On the evolution of the volute suspension system, see Daniel Chase, "Combat Car," in "The Development Record in Combat Vehicles," in Vol. II "Research and Development," Icks Collection, Patton Museum, pp. 18-21; Memorandum: for the Chief of Staff, Subject: Volute Suspension for the Light Tank, T2, 25 April 1934; Subject: Light Tank T2-Application of Volute Spring Type Suspension, Sub-Committee on Automotive Equipment to Ordnance Committee Technical Staff, 1 May 1934; and Subject: Light Tank T2, To: Adjutant General, 4 May 1934, RG 156, NA.

[8]"German Expert Finds U.S. Tanks would not Stand Test of War," *New York Times*, 21 November 1936, pp. 1-2.

[9]Guderian, *Achtung-Panzer! The Development of Armoured Forces, Their Tactics and Operational Potential* (London: Arms and Armour Press, reprint 1993), p. 153.

[10]"Army Denies Tanks are Second Rate," *New York Times,* 22 November 1936, p. 7.

[11]Bradley, *A Soldier's Story* (New York: Henry Holt and Company, 1951), pp. 40-41.

[12] "Military Science Review," (the official publication of the German War Ministry), Subject: Motorized Combat Troops in America (A German Estimate), MID Report No. 14,504, Berlin, 1 February 1936, RG 165, NA, p. 1.

[13]Guderian, "Armored Troops and Their Cooperation with Other Arms," MID Report No. 14,994, Berlin, 15 December 1936, RG 165, NA, pp. 1-25.

[14]*Tables of Organization Mechanized Division (Tentative)* (Fort Leavenworth: The Command and General Staff School Press, 1936), pp. 3-24, and *Tactical Employment of the Mechanized Division* (ibid., 1937), pp. 3-4, 6, 23-24, 31.

[15]Memorandum for the Assistant Chief of Staff, G-2, Subject: Visit of German Army Officer to Army Posts in the United States to see Latest Type Light Tanks and Combat Cars use in the United States Army, MID Report 343-W-97, 16 June 1937, RG 165, NA, pp. 1-2.

[16]Subject: Visit of Lt. Colonel von Schell to Fort Meade, To: Commanding General, HQ 66th Infantry (Light), MID Report 343-W-97, 25 June 1937, RG 165, NA, pp. 1, 3.

[17]Ibid., p. 2.

[18]Subject: Visit of Lt. Colonel von Schell, German Army, To: The Commandant, The Infantry School, 21 July 1937, pp. 1-3; Memorandum For: The Commandant, 24 July 1937, pp. 1-2; and Notes regarding visit of Foreign Officer (Col von Schell, German Army) and certain views expressed by him, pp. 1-2, MID Report No. 343-W-97, RG 165, NA.

[19]Subject: Visit of Lt. Colonel von Schell, German Army, to Fort Knox, Kentucky, To: Adjutant General of the Army, Washington, D.C., MID Report No. 343-W-97, 23 July 1937, RG 165, NA, pp. 1-4.

[20]Ibid., p. 2.

[21]Ibid., p. 1.

[22]Grow, "Ten Lean Years," *ARMOR* (July-August 1987), p. 38.

[23]Jonathan M. House, *Combined Arms Warfare in the Twentieth Century* (Lawrence, Kan.: University Press of Kansas, 2001), pp. 82-83

[24]James S. Corum, "The Spanish Civil War: Lessons Learned and Not Learned by the Great Powers," *The Journal of Military History* (April 1998): pp. 325-27.

[25]War Department, Field Service Regulations United States Army 1923: Operations (Washington: GPO, 1924), pp. 21-23; Mitchell, Winged Defense. The Development and Possibilities of Modern Air Power – Economic and Military (New York: G. P. Putnam's Sons, 1925), pp. 188-89; and Thomas H. Greer, The Development of Air Doctrine in the Army Air Arm 1917-1941 (Washington: GPO, reprint 1985), pp. 12, 66-67.

[26]Albert C. Wedemeyer, *Wedemeyer Reports!* (New York: Henry Holt and Co., 1958), pp. 61-62.

[27]Guderian, *Panzer Leader*, (London: Michael Joseph, 1952), pp. 316-17.

[28]Subject: Reform of the German Automobile Industry (An Industrial Mobilization Measure), MID Report No. 16,301, Berlin, 1 December 1938, RG 165, NA, pp. 1-5.

[29]Oral Presentation, "Mechanization and Defense Against Aviation," G-3 Course, AWC, 1938-1939, Report of Committee No. 5, 7 October 1938, United States Army Military History Institute, p. 11.

[30]Subject: Policies governing mechanization, and tactical employment of mechanized units, 6 April 1938, AG 537.3 (4-6-38), RG 407, NA, pp. 1-4.

[31]Henry J. Reilly, "Proving Ground in Spain. Armament Trends as Revealed by the Spanish War," *Army Ordnance* (May-June 1939): pp. 333-36.

[32]Subject: Letters of Transmittal, Re: Proceedings of Board, 27 July 1938; Chief of Cavalry to Chief of Field Artillery, 6 October 1938; Chief of Field Artillery to Chief of Cavalry, 17 December 1938; and Chief of Cavalry to Chief of Field Artillery, 5 January 1939, RG 156, NA, pp. 1-6.

[33]Subject: Self-Propelled Mount for a 75mm Howitzer, 8th Endorsement, 17 April 1939, OO 472/3496, RG 156, NA, p. 13, and Richard P. Hunnicutt, *Stuart: A History of the American Light Tank*, Vol. 1 (Novato, Calif.: Presidio Press, 1992), p. 317.

[34]Heiberg, "Organize a Mechanize Force," pp. 24-28, and Chaffee, "The Seventh Cavalry Brigade in the First Army Maneuvers," *Cavalry Journal* (November-December 1939): pp. 450-61.

[35]Van Voorhis quoted in "Prelude to Armor," pp. 5-6.

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